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Description

KIT FOR DISLODGING OBSTRUCTIONS IN WATER LINES

Cross Reference to Related Applications

[0001] This application claims priority from Provisional Patent Application Serial Number 60/493,833, filed August 8, 2003, by Joyce L. Buchanan and Michael D. Buchanan.

Background of Invention

[0002] This invention relates to a kit for flushing and clearing obstructions from lines that carry water. In particular, it relates to a kit that contains a valve-controlled conduit, one end of which connects to a source of water under pressure and the other end of which connects to any of at least two elastomeric stoppers.

[0003] Water-going vessels have many uses for the water in which they float. The water may be used to cool an engine or generator or for air conditioning or refrigeration systems. It can be used to flush the head (i.e., the toilet) and to make potable water (e.g., by reverse osmosis or distil-

lation). It provides water to wash down pumps, for putting out fires, and for circulation pumps for bait and tanks for aquatic plants and/or animals.

[0004] Water is brought into a vessel through thru-hulls (water inlets), which are located below the waterline. Thru-hulls are connected to seacocks, valves that control the flow of water through the thru-hull. After the water has served its purpose, it is discharged back into the surrounding water through outlets that are located above or below the waterline. Discharged water may come from discharge lines for cooling or making water, from flushing heads or bilge pumps, or it may be from drains on the deck, in the cockpit, or from a sink.

[0005] Grass, plastic bags, jellyfish, and other items can be drawn into a thru-hull and can obstruct or clog the water lines. A sea strainer (coarse filter) is often used on the water line downstream of the seacock to prevent obstructing materials from reaching pumps or other systems that use the water, but sea strainers cannot prevent the materials from entering and clogging the thru-hulls and seacocks.

[0006] Discharge lines can become clogged by corrosion or by materials that pass through a sea strainer. Drains can be clogged with food, soap scum, dirt, or debris. Waste lines

can be clogged by waste or toilet paper. Bilge discharge lines can be clogged with oil, grease or algae. Some lines need to be flushed periodically to prevent them from becoming clogged, and lines that are obstructed should be cleared immediately.

[0007] Clogged water lines can be cleared using plumbing snakes, chemical drain cleaners, and plungers, but these are sometimes ineffective, difficult to use, and may involve dangerous or polluting chemicals. A traditional method of clearing obstructed thru-hulls is to close the seacock, remove the hose attached to the seacock, and put a rod or stick in the opening. The valve is opened and the rod is pushed through the seacock and out the hull of the vessel, dislodging the obstruction. The rod is removed, the seacock is closed, and the hose is reattached. However, while the seacock is open, water pours into the vessel because the thru-hull is below the water line. This can draw the obstruction back into the thru-hull. Alternatively, a thru-hull can be cleared by having a person swim under the boat and remove the obstruction. Marine heads may also be difficult to clear when they become clogged because they have a one-way valve in the discharge line.

SUMMARY OF INVENTION

[0008] We have invented a kit that contains components for unclogging or clearing most types of water lines encountered on water-going vessels, in homes, and at other locations. The kit contains a set of elastomeric stoppers that will form a seal with common circular openings to lines that carry water. One end of a conduit controlled by a valve is inserted into an aperture through the center of a stopper and the other end of the conduit is attached to a source of water under pressure. Because the stoppers are elastomeric, they form a watertight seal with the opening, preventing water from flowing around the stopper, even if the opening is connected to a thru-hull that is below the water line. An operator holds the stopper against the opening of the line to be cleared with one hand and opens the valve on the seacock, if there is one, with his other hand. When the valve on the conduit is opened, pressurized water forces any obstructions in the line back out the way they came in. Thus, only a single person is needed to clear a line using the kit of this invention. No dangerous or corrosive chemicals are required and it is not necessary to insert a rod to push out an obstruction or disconnect and reconnect water lines.

[0009] The kit of this invention may also contain a 90° elbow,

which is useful if the opening to the line is not easily accessible, such as when there is a sea strainer attached to the seacock. Sea strainers may have a very small opening at the top, and the opening that leads to the seacock is often on the side of the sea strainer (see Figure 6). Thus, it is difficult to insert a rod or plumbing snake or some other devices into the sea strainer and then into the seacock and the thru-hull. However, in the kit of this invention, a stopper can be attached to the 90°elbow and the 90°elbow can be attached to the conduit and inserted into the sea strainer so that the stopper can be pressed against the opening to the line.

[0010] Accordingly, in addition to flushing and clearing obstructions from water lines, it is also an object of this invention to provide a product that:(a) meets the obstruction-clearing demands of marine vessels; (b) meets the raw water system flushing demands of marine vessels;(c) will form a true watertight seal with a wide range of openings, without requiring excessive force from a user to hold the sealing unit in place;(d) allows a stopper to be positioned against water line openings that are in tight places;(e) allows single-handed operation, by allowing a sealing stopper to be positioned and held in place and the flow con-

trol valve to be operated with one hand; (f) is of small size and weight, facilitating storage on a marine vessel; (g) is easy to use and can be used quickly and cleanly, without creating a mess in the vessel or on the user; and(h) is durable, unlikely to fail, has a long life, and is inexpensive to manufacture. Still further objects and advantages will become apparent from a consideration of the ensuing description and drawings.

Brief Description of Drawings

[0011] Figure 1 is an isometric view of a certain presently preferred embodiment of a kit according to this invention.

[0012] Figure 2 is an isometric view of a set of stoppers for use in a kit according to this invention.

[0013] Figure 3 is an isometric view of a conduit controlled by a valve for use in a kit according to this invention.

[0014] Figure 4 is a side view in section of an extension for use in a kit according to this invention.

[0015] Figures 5A and 5B are side views in section illustrating the use of a kit according to this invention for removing an obstruction from a thru-hull opening in a marine vessel.

[0016] Figure 6 is a side view in section illustrating the use of a kit according to this invention for removing an obstruction from a thru-hull opening in a marine vessel that has a sea

strainer rigidly attached to a thru-hull and seacock.

[0017] Figure 7 is a side view in section illustrating the use of a kit according to this invention for removing obstructions from the discharge line of a head in a marine vessel.

[0018] Figure 8 is an isometric view illustrating the use of a kit according to this invention for clearing a clogged deck drain that is covered with a grating.

DETAILED DESCRIPTION

[0019] In Figure 1, kit 1 includes plastic container 2 with a re-sealable lid, which holds instruction manual 3, a set of five tapered elastomeric stoppers 4, a conduit 5 controlled by valve 6, a 90° elbow 7 (Figure 6), and an extension 8. Container 2 is preferably made of clear plastic, such as polyacrylate, polyethylene, or polypropylene, but could also be made of other materials, such as cardboard or metal. A preferred material is recycled polyethylene terephthalate. Instruction manual 3 is a small booklet that explains how to use the kit in many different applications to clear or clean lines that carry water.

[0020] Referring to Figure 2, each kit according to this invention contains at least two tapered elastomeric stoppers. While the stoppers used in the kit may be selected for the particular application that the kit is to be used for, it is

preferable for the kit to include a stopper 9 that can plug an opening of about 2¼ inches in diameter, a diameter that allows the stopper to plug the outlet of a marine head and to cover drains on water-going vessels. The remaining stoppers are preferably a subset 10 of about 3 to about 5 stoppers of different sizes that can plug smaller openings. A variety of sizes is needed because the openings to water lines vary widely in size for different types of vessels. For example, subset 10 may contain 4 stoppers that can plug any opening having a diameter between about ¾ and about 1 5/8 inches, which covers most of the openings to lines that carry water on the majority of water-going vessels. That is, because the stoppers are tapered, with one end of the stopper having a larger diameter than the other end, each stopper can plug any circular opening having a diameter in between the diameter of its two ends. Preferably, the stoppers in the subset are selected so that the smaller diameter of a stopper is slightly less than the larger diameter of the next smaller stopper.

[0021] The stoppers may be described as truncated cones, typically about ¾ to about 1¼ inches long. Preferably, the taper is about 5 to about 15 degrees, with the larger stoppers having a greater taper, as it has been found that ta-

pers of fewer degrees may be difficult to remove from openings and too many stoppers may be needed and tapers of greater degrees may not form as good a seal. Stoppers are numbered according to their standardized sizes. The following table is an example of standard stopper sizes that may be used in a kit according to this invention; all are about an inch long:

Size	Top Diameter (inches)	Bottom Diameter (inches)	Taper Angle (degrees)
3	0.937	0.719	6.2
5	1.062	0.906	4.5
6	1.343	1.062	8.0
8	1.625	1.312	8.9
11.5	2.469	2.000	13.2

[0022] All the stoppers in the set have a circular aperture 11 through their central axis, and the diameter of that aperture is the same for all of the stoppers. The diameter of this aperture is preferably about 3/8 to about 5/8 inches,

as diameters within that range permit a sufficient flow of water to dislodge most obstructions, but the aperture is not so large that it weakens the stoppers; however, larger or smaller diameters may be used if desired.

[0023] The stoppers are made of an elastomeric material, that is, a material, such as natural or synthetic rubber, that can be slightly compressed under pressure but will resume its original shape when the pressure is removed, so that they can form water-tight seals with the openings they plug. Stoppers 4 are rigid enough to hold their shape when forced into an opening, but flexible enough to conform to the opening and create a watertight seal.

[0024] Referring to Figure 3, conduit 5 has a female threaded connection 12 at one end that screws onto a male connector of a water hose 13 (Figures 4A, 4B, 5, 6, and 7), such as a standard garden water hose. Water hoses on vessels supply water at a pressure of about 35 to about 40 psi and water hoses in homes may have pressures of about 65 psi; higher or lower pressures may also be used. A National Hose Thread (NHT) water hose connection has a diameter of ¾ inch and has 11½ threads per inch. At the other end of conduit 5 is a barbed connection 14 that can be inserted into aperture 11 in any of the stoppers 4 to

form a tight seal with the stopper. Valve 6 may be any type of water valve, but a ball valve, as shown in Figures 5A, 5B, and 6, is preferred as it has a straight flow-through design. Conduit 5, including the flow control valve 6, and connections 12 and 14, are preferably constructed of polyamide (e.g., "Nylon"™), polyethylene, polypropylene, brass, or other materials that are rigid and resist corrosion in a marine environment.

[0025] In Figure 4, extension 8 is a flexible tube 15 that has an inside diameter that is the same as the inside diameter of the aperture in the center of the stoppers. Tube 15 is connected to a rigid barbed tube 16, of the same outside diameter as connection 14. Extension 8 may be connected to conduit 5 and/or to elbow 7 or to stopper 4 as needed to reach the opening to a water line that may otherwise be inaccessible. Tube 15 may be made of vinyl or other pressure-resistant, corrosion-resistant material and may be flexible or semi-rigid. A preferred material is ethylene vinyl acetate.

[0026] Referring to Figure 5A, thru-hull 17 is mounted below the waterline in hull 18 of a vessel and is connected to closed seacock 19 (valve handle not shown). Obstruction 20 blocks the entrance to thru-hull 17, preventing water

from entering the vessel through the thru-hull. Female connection 12 of conduit 5 is screwed onto hose 13 that carries water under pressure. Valve 6 is closed and the water in hose 13 is turned on. The operator, using one hand, firmly presses stopper 4 against the opening of seacock 19. Using his other hand, the operator opens seacock 19 and valve 6, which permits the pressurized water in hose 13 to flow through valve 6, seacock 19, and thru-hull 17, expelling obstruction 20, as shown in Figure 5B. The removal of the obstruction is thereby performed simply and quickly by a single person.

[0027] Figure 6 illustrates a situation similar to that shown in Figures 5A and 5B, except that sea strainer 21 is attached by tubing 22 to seacock 19. In order to plug opening 23 in sea strainer 21, 90° elbow 7 has been inserted in between stopper 4 and conduit 5. Elbow 7 is a flexible tube 24, similar to tube 15, which is inserted into rigid barbed L-shaped tube 25, which is similar to tube 16. The procedure described in the previous paragraph is repeated, again by a single operator.

[0028] In Figure 7, head 26 on a vessel is connected to a line 27 that leads to a holding tank (not shown) or to the outside of the vessel. If line 27 is clogged, conduit 5 is connected

to hose 13 and connection 14 is inserted into stopper 9. The operator presses stopper 9 against discharge opening 28 of head 26 with one hand and opens valve 6 with the other hand, allowing pressurized water from hose 13 to flow through line 27, dislodging the obstruction. The technique shown in Figure 7 can also be used to clear sink, lavatory, and other drain lines that are obstructed or running slowly.

[0029] Referring to Figure 8, the discharge line (not shown) leading from a deck drain covered with grating 29 is obstructed. Conduit 5 is again inserted into stopper 9, but now it is inserted into the smaller diameter end of stopper 9. The larger diameter end of stopper 9 is then pressed against grating 29 and the pressurized water is released, as hereinbefore described, removing the obstruction. If this technique fails to clear an obstructed deck drain, the drain may be cleared by back flushing, positioning conduit 5 with a properly selected stopper against the exterior opening of the thru-hull for the drain and sending pressurized water back up through the drain.

[0030] Salt water or brackish water left standing in engine cooling and exhaust systems, refrigeration systems, heat exchangers, heads and waste lines, pumps, hoses, and other

lines may form hard deposits that can cause significant problems when attempting to restore these systems to an operational state. The systems should be flushed with fresh water before such deposits are formed, and sealed with the fresh water left in the system. Using the kit of this invention, fresh water can be supplied to the engine cooling water inlet thru-hull even when the vessel has been hauled. The engine can be started and run for several minutes, forcing the seawater from all of the compartments that use the water, and replacing it with fresh water. When the engine is stopped, the inlet thru-hull can be closed before the flow of fresh water is terminated. This prevents the fresh water from draining back out of the system, keeping it properly lubricated till the vessel is placed back into the water. Refrigeration systems, air conditioning systems, heads, waste lines, pumps, and hoses can also be flushed with fresh water.

[0031] The following examples further illustrate this invention.

[0032] EXAMPLE

[0033] A 1 by 4 by 6-inch kit container as illustrated in Figure 1 was molded from clear recycled polyethylene terephthalate. The kit, available as "BlastItOut"™ from Itex, Inc.,

contained five stoppers, sizes 3, 5, 6, 8, and 11.5, made of laboratory grade styrene-butadiene rubber (SBR), Buna S, GRS.1, each with a ½ inch diameter aperture in the center. The kit also contained a conduit controlled by a ball valve having a barbed end about ½ inches in diameter and a female threaded end for connection to a male coupling of a garden hose, a rigid 90° elbow having a barbed end about ½ inch in diameter and elastomeric ethylene vinyl acetate tubing on the other end with an internal diameter of ½ inch, a straight extension with the same type of ends as the elbow, and an instruction booklet that explained how to use the kit to clear various types of lines that carry water. The kit was tested in a variety of situations where a water line was obstructed or needed to be flushed.

[0034] Situation 1

[0035] A plastic bag was pulled into the water inlet thru-hull of a boat in Trinidad. The thru-hull fed raw water to the boat's refrigeration system, which overheated and shut down. The owner disconnected the water line from the seacock, and repeatedly attempted to dislodge the bag by inserting a stick into the seacock. Each time the bag was moved and flow restored, the bag would flow back into the opening when the stick was removed. The above-described

"BlastItOut"™ kit was finally used to force water back out of the thru-hull. The water was left running for about 30 seconds, which moved the bag well away from the inlet. Normal operation was restored. If the "BlastItOut"™ kit had been used initially, there would have been no reason to disconnect the hose from the seacock. Pressurized water could have been injected through the attached sea strainer. No plumbing disconnections would have been required, and no mess would have been introduced into the boat.

[0036] Situation 2

[0037] A large, expensive power yacht in Ft. Lauderdale, Florida was having trouble with the air conditioning system. The high temperature and high humidity of Florida were causing soft growth in the condensate water drain lines. Chemical and mechanical techniques for clearing the lines had been employed for years, with limited success. The "BlastItOut"™ kit was tried and was found to work instantly, with no mess. Preventive maintenance on that yacht now includes flushing all such lines at regular intervals, before they become clogged.

[0038] Situation 3

[0039] A cruising sailboat in Grenada had a problem with their marine head system. The waste lines needed to be cleaned frequently, a job no one wanted to do. The problem was due to the routing of the lines, which caused residue to settle at several places. There was no way to re-route the lines. The problem was solved by using the "BlastItOut"™ kit on a regular basis, before the lines became clogged. The increased flow of water through the lines pushed out most of the material, and diluted the remainder. Importantly, the "BlastItOut"™ kit could be used when the heads were clean. Again, there was no mess in the boat, and it was not necessary to disconnect the plumbing.

[0040] Situation 4

[0041] An expensive sailboat in the US Virgin Islands had a recurring problem with a coaming drain (a drain for the small area that surrounds the cockpit). The drain would clog frequently. The drain was located inside the coaming, which made it nearly inaccessible. The owner tried mechanical and chemical solutions, but neither worked well. A "BlastItOut"™ kit was used to reverse flush the drain. A small stopper was placed on one end of the conduit, and the stopper placed in the drain output. It was only neces-

sary to push a small amount of water through the drain line to clear the clog. This procedure is now performed regularly on that sailboat.